636.0

FILE COPY

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

THE OCHOCO - MCKAY CREEK PINE BEETLE CONTROL PROJECT

ANALYSIS OF RESULTS AND RECOMMENDATIONS FOR ADDITIONAL CONTROL WORK DURING FALL OF 1933.

By
F. P. Keen
Entomologist
U.S. Bureau of Entomology

October 9, 1933.

Forest Insect Field Station
445 U.S. Court House
Portland, Oregon.

U. S. GOVERNMENT PRINTING OFFICE: 1933 176133

THE OCHOCO-MCKAY CREEK

PINE BEETLE CONTROL PROJECT

Analysis of Results and Recommendations

For Additional Control Work

During Fall of 1933

By

F. P. Keen

Entomologist

U. S. Bureau of Entomology

October 9, 1933

Forest Insect Field Station
445 U.S. Court House
Portland, Oregon

C O N T E N T S

	Page
Development of the Project	1
Beetle Losses Prior to Control	1
Control Work By the Forest Service	3
Control Work by Private Owners	3
Areas Left Untreated.	3
Results as Shown by the Survey of 1933	4
Effect of Winter Killing of Broods	5
Trend of Losses on Untreated Areas.	5
Reduction of Losses on Treated Areas	5
Other Effects of Control Work.	6
The Reinfestation of 1933	7
Recommendations for Recleaning Program Fall of 1933	8
Summary	10
Map.	

Development of the Project

The history and progress of the Ochoco-McKay Creek pine beetle control project has been very thoroughly covered in previous reports by Mr. A. Jaenicke, of the Forest Service, and Mr. Duncan McLean, representing the Alexander-Yawkey interests. Briefly, the project was organized to combat a very sudden and alarming outbreak of the western pine beetle, which first made its appearance in the fall of 1931 and spring of 1932. The Alexander-Yawkey Timber Company, owners of 20,000 acres of timber land on the western edge of the Ochoco National Forest, decided that control measures were necessary to prevent what might prove to be a disastrous depletion of their mature timber stands, through uncontrolled western pine beetle depredations. They appointed Mr. J. F. Kimball as their agent in carrying out such control work. The Forest Service was requested to clean up the beetle infestation on intermingled and adjacent National Forest lands lying to the east of this tract, in order to prevent reinfestation from the east. Such a program was approved and during the period October 24, 1932, to January 31, 1933, carried out by beetle control crews under the supervision of the Forest Service and Mr. Kimball's organization. Work on the intermingled lands of other private timber owners was made possible by the declaration of a "Zone of Infestation", by the State Forester, in November, 1932.

Beetle Losses Prior To Control

For three years prior to the starting of control work, the destruction of ponderosa pine timber on the 56,000 acres included in the control project amounted to 61,000 M. board feet, or over 10 per cent of the pine stand. The distribution of this loss by years and ownership is shown on the following tables:

Table Number One

Acreage and Timber Volumes. McKay Creek Project

	Acreage	Estimated Timber Volume
National Forest	17,960	160,000 M. Feet
Public Domain	1,800	5,000 M. Feet
Alexander Yawkey Timber Company	20,460	300,000 M. Feet
Other Private Lands	16,200	100,000 M. Feet

Table Number Two

Beetle Losses on McKay Creek Project Prior to Control

Year	National Forest		Private		Total	
	Volume Lost M.B.M.	Percent Stand	Volume Lost M.B.M.	Percent Stand	Volume Lost M.B.M.	Percent Stand
1930	500	.3	1,500	.4	2,000	.3
1931	3,000	1.6	12,000	3.0	15,000	2.6
1932-(1)	7,000	3.9	37,000	9.2	44,000	7.6
Total	10,500	5.8	50,500	12.6	61,000	10.5

(1) Revised Estimate based upon the plot work of this year.

These losses were very unevenly distributed. The National Forest Lands lying at the higher elevations suffered the least, while to the west on Turner Ridge, the infestation was at its worst. On one section 970 trees were marked for treatment, and one plot showed a total loss for 1932 of 746 trees on 320 acres, or nearly 1300 trees per section, or approximately 20 per cent of the standing timber. On certain 40 acre tracts practically the entire mature timber stand was wiped out during the three years of the epidemic, with most of the losses occurring in 1932.

Control Program of Fall 1932

Because of the severe beetle epidemic in progress over extensive areas of the Ochoco National Forest and adjacent timberlands, this office did not consider control feasible unless a more or less solid block of timber within natural topographic boundaries could be completely cleaned up in one season. On this basis a control program was approved in which all of the timbered area, approximately 56,000 acres, lying south of the Aubrey Mountain, Foley Butte, Hash Rock, divide and west of the Hash Rock-Green Mountain Ridge was scheduled for treatment in the fall 1932- spring 1933 season.

Cooperative agreements between the Forest Service and Mr. Kimball were made to avoid duplication of effort. Two camps were established, one under Forest Service and one under Mr. Kimball's direction. In addition Mr. Kimball initiated a system of gypo control work, whereby small groups of treaters carried out the control measures on a piece work basis. The details of the control work are given very fully in a report by Mr. A. J. Jaenicke dated February 15, 1933. Only the final accomplishments are of interest to us here.

Control Work by the Forest Service

The camp operated by the Forest Service completed the treatment of its share of the project during the period October 31 to December 20, 1932. A total of 4,146 trees were treated on 18,000 acres at a total cost of $10,244.90, or about $2.47 a tree. Practically all of the trees spotted were treated and a complete cleanup made.

Control Work by the Private Owners

Mr. Kimball's organization with 37,000 acres to cover in order to complete its portion of the outlined program, ran into many difficulties. Financial backing was assured from the Alexander-Yawkey interests, for the treatment of their holdings of 20,000 acres, but none of the other smaller owners holding 16,000 acres, voluntarily contributed any financial assistance. The State beetle law did not become operative until November, and the contract for handling of these lands was not signed with the State Forester until late in December. Thus the treatment of the intermingled lands of various private owners was delayed and much infestation left untreated, even in the middle of treated sections. Moreover there was found to be such an enormous number of partly abandoned trees that upon advice of this office, many of these were left untreated and the work concentrated on the fully infested trees, especially those newly infested containing eggs or small larvae.

Thus the control work on the private lands was far from complete, even on the 18,000 acres covered in the treatment. On this area 11,354 trees were treated, at a cost of approximately $20,500, or a cost of only $1.77 a tree. This record low cost was due largely to the gypo system. The character of this work was fully as satisfactory as that ordinarily done on the straight wage basis.

The work on private lands continued from October 24th, 1932, until January 31, 1933, when it was closed by Mr. Kimball on account of deep snows and upon recommendation of this office that the freezing of larvae by the cold spell of December, made further work of questionable value.

Areas left Untreated

When the work closed at the end of January, there was approximately 18,000 acres, with 8,500 infested trees, left untreated to the west and south of the treated areas. This area included Turner Ridge, which carried some of the heaviest infestation, (1500 trees of 1932 loss on one section), to be found any place on the project. Adjoining this was a considerable area in which the treatment was only partially completed as indicated before.

Results as Shown By the Survey of 1933

In order to secure some detailed information on the results secured from last year's control work and to determine the need for further work on this project, a cooperative survey was conducted by the Bureau of Entomology and the Forest Service during the period September 25 - October 5, 1933. Two insect survey crews of three men each were hired by the Forest Service under N. R. A. insect control funds and placed under the supervision of this office to make a check cruise of the treated and untreated areas. Mr. Kimball turned over two of his spotters who were employed under this fund.

The personnel included:

Mr. F. P. Keen, Entomologist in charge.
Mr. W. J. Buckhorn, Scientific Aide.
Mr. J. W. Whiteside, Assistant Field Aide.

Forest Service:

Mr. A. J. Jaenicke, Forest Examiner.

Forest Service (N. R. A. Employees:)
Crew No. 1:
Mr. F. W. Schlegel, Crew Leader and Compassman.
Mr. Earl Adams, Spotter.
Mr. Glenn Adams, Spotter.

Crew No. 2:
Mr. Cal Francis, Crew Leader and Spotter
Mr. L. V. Hunter, Compassman.
Mr. Hein, Spotter.

Sample plots of 320 acres each, well distributed throughout the project area were cruised in the usual way. On each plot the 1932 untreated trees were tallied, and the newly infested 1933 summer and winter brood trees recorded. These trees were blazed and numbered, so that the plots can be used to better advantage for subsequent examinations.

Effect of Winter Killing of Broods

In the writer's report of October 1, 1932, the statement was made that "unless the broods are winter killed, which is a rather remote possibility, the emergence next spring will be tremendous and a heavy summer kill in 1933 is inevitable". However, this "remote possibility" occurred and for the first time, as far as known, since the winter of 1924 a period of extremely low temperatures during December destroyed 53 percent of the larvae hibernating in trees on the McKay Creek area, and a similar mortality occurred over the entire Ochoco Forest. This had a very beneficial effect in helping to control the epidemic, and subsequent examinations have shown that the new losses of this year have been reduced almost in the same proportion as the overwintering broods were killed by the cold winter.

Trend of Losses on Untreated Areas

Before a fair appraisal can be made of the effectiveness of any control work, some information must be secured as to what the probable trend would have been had no control work been done. For this reason a large number of plots were cruised on nearby untreated units to determine this natural trend.

The results of the sample plot cruises in Mill Creek and Willow Creek on untreated areas to the east and west of the treated areas showed the following reductions in the 1933 losses over those of 1932.

Table 3

Comparison of Infestation on Untreated Plots

Plots	Overwintering Loss			Total Yearly Loss		
	1932	1933	Red	1932	1933	Reduction
Willow Creek	Trees	Trees	%	Trees	Trees	%
T 12 S, R 16 E Sec. 31 W½	465	168	64%	746	280	62%
T13S R16E, Sec. 7 N½	78	66	15%	172	121	30%
Mill Creek						
T13S R17E Sec. 23S½	24	21	12%	88	30	66%
T13S R17E Sec. 34W½	61	75	+23%	154	86	44%
T13S R18E Sec. 5W½	69	75	+ 8%	187	125	33%
T13S R18E Sec. 8E5/4	306	251	18%	478	306	36%
Total 2080 acres	1003	656	34%	1825	948	48%

The cruises on these plots show an average reduction of 48 percent in the 1933 loss over that of 1932, or in other words the 1933 infestation was reduced about half due to the winter freeze and only killed about half as many trees as were killed by beetle attacks in 1932.

Reduction of Losses on Treated Areas

On the treated areas the marked reduction in losses during the present year was very evident even to the casual observer. No large groups of newly killed trees could be found and the trees which were killed were for the most part unhealthy individuals, or trees with suppressed crowns. The plots cruised brought out the effectiveness of the work in a striking manner.

Table 4.
Comparison of Infestation on Treated Plots

	Overwintering Loss			Total Yearly Loss		
	1932	1933	Reduction	1932	1933	Reduction.
Forest Service Area	trees	trees	%	trees	trees	%
T12S R17E Sec.23	209	31	85%	288	41	86%
T12S R17E Sec.34 S½	194	39	80%	302	61	80%
T13S R17E Sec.29S½	81	14	82%	127	20	84%
Private Area						
T12S R16E Sec.25E½	307	31	90%	650	88	86%
T12S R16E Sec.34E½	469	60	87%	565	93	83%
T12S R17E Sec.30E½	182	27	85%	239	54	77%
(Partly treated)						
T12S R16E Sec.20E½	278	6	98%	368	16	95%
Total 2240 acres	1920	228	87%	2539	373	85%

As will be noted all plots both on the private and Forest Service areas showed a striking uniformity in the reduction which was secured, averaging about 85 per cent. The only plot out of line was Sec.20E½ T12S R16E where only 40 trees out of 278 were treated. For some unknown reason this plot showed the best reduction of all - practically 95 percent.

With the treated areas showing a reduction in losses of 85 per cent and the nearest untreated areas showing a natural reduction of 48 percent, we can reasonably conclude that 37 per cent of the reduction on the treated areas was directly due to the control work.

Table 5
Reduction of Losses on Treated Areas

	Volume Killed		Saving
	1932	1933	
National Forest Area	7,000 M.ft.	1,000 M.ft.	6,000 M.ft.
Private Area	18,000 M.ft.	2,700 M.ft.	15,300 M.ft.
Total	25,000 M.ft.	3,700 M.ft.	21,300 M.ft.

Of this saving in the first year following control, practically 8 million board feet can be credited as directly due to the control work.

Other Effects of Control Work

Besides the reduction in total volume of timber killed on the treated areas, the breaking up of the large groups of infested trees gives additional evidence of the effectiveness of the control operations. The size of these groups on the treated and untreated areas cruised is indicated in the following table.

Table 6

Number of Trees Killed in Largest Group

Treated Areas	Overwintering Infestation of 1932	1933
Forest Service		
T12S R17E Sec.23	17	4
T12S R17E Sec. 34S½	14	3
T13S R17E Sec.29E½	8	2
Private		
T12S R16E Sec.34E½	81	7
T12S R16E Sec.23E½	27	3
T12S R17E Sec.30E½	25	4
T12S R16E Sec.20E½	22	1
Untreated Areas		
T12S R16E Sec.31W½	46	43
T13S R16E Sec. 6E3/4	39	29
T13S R19E Sec. 9E½	37	12
" " " W½	67	17
T13S R19E Sec.27E½	20	27
" " " W½	52	29
T15S R19E Sec.7W½	16	32

Another noticeable difference between the treated and untreated areas was in the character of the trees infested and the type of infestation. On the treated areas no strong groups of western pine beetle were present and the mountain pine beetle and Ips represented a higher percentage of attacking beetles than before. The trees killed were largely weakened trees, trees with suppressed crowns, trees previously top-killed, or trees partially attacked in the previous year. The overwintering broods were less in evidence than the summer broods.

On the untreated areas large groups of trees killed primarily by the western pine beetle, with the mountain pine beetle and Ips playing a minor role were the rule. Larger and healthier trees were being killed and the size of the new overwintering groups was noticeably larger than the summer groups. It is evident on most of the untreated areas that the infestation is rapidly recovering from the set back due to last winter's freeze and is again developing aggressiveness.

The Reinfestation of 1933

The infestation of 1933 on the treated areas has very evidently come from the beetles which escaped both the control and the winter killing. In the control work many partially abandoned trees were purposely left as having too few beetles to justify the expense of treatment. The study of the winter kill showed that contrary to expectation it was these dry partially abandoned trees in which broods survived the cold to the best advantage. The heaviest loss from winter killing occurred in the broods of small larvae in the inner, moist bark of green trees. Thus small larvae in the moist inner bark, close to the wood and supposedly protected by a

thicker layer of bark were killed more readily than full grown larvae in the outer, dry bark, with apparently much less bark protection.

Also contrary to theory, there was very little evident migration of broods from the heavily infested untreated areas into the adjoining untreated areas. The greatest reduction of all the check plots, (96%) occurred on one (Section 20, E½, T. 12 S., R 16E.) which directly adjoined untreated infestation. Another plot (Section 34 E½ T. 12 S., R. 16 E.) which bordered untreated areas showed a reduction of 83 percent. The poorest reduction, 77 percent, was on a plot (12 S. R. 17 E., Section 30 E. ½) in the very middle of the treated area. Thus there is no evidence to indicate that in this case imigration of beetles has been a factor of any importance.

Recommendations For Recleaning Program

Fall 1933

The survey just completed shows that the control work together with the winter killing of brood has so completely reduced the infestation on the McKay Creek project that over much of the area the infestation is now in the endemic status; with less than 60 infested trees per section representing this year's overwintering loss. With an 85 percent reduction, only sections carrying a 1932 infestation of more than 400 trees now have more than 60 trees per section of 1933 infestation and need to be included in a recleaning program.

On the Forest Service area the most heavily infested section in 1932 had only 308 trees. This section should only have 46 trees overwintering this year, or hardly enough to justify treatment.

On the private area the most heavily infested section in 1932 had 970 overwintering trees. This section showed 120 overwintering infested trees this year and should be recleaned.

On the basis of the recent cruise the 1933 overwintering infestation on the McKay Creek Project is estimated as follows:

1933 Overwintering Infestation

	Acres	Average Trees per Section.	Total Trees Infested
Forest Service (Treated)	17,960	30	850
Private Area (Treated)	17,940	70	2,000
Private Area (Untreated)	18,760	130	4,000

In view of the satisfactory cleanup over most of the treated area it is recommended that only such portions of the area as show an overwintering infestation of more than 60 trees per section be included in the clean up program. This will limit the work to the following amounts:

1933 Infestation Requiring Treatment

	Acres	Average Trees per Section	Total Trees Infested
Forest Service Area			
Private Area (Recleaning)	7,680	100	1,200
Private Area Untreated	18,760	130	4,000

Thus the recommended program for this year resolves itself into the recleaning by private owners of 7,680 treated last year, (12 sections carrying 1932 infestation in excess of 400 trees - all in Township 12, S. R. 16 E.) and the extension of the clean up to the other private lands not reached last year. It is estimated that this program will involve the treatment of 5,200 trees at a cost of approximately $10,000.

Following the treatment of this year the entire area should be kept under close observation for a number of years to avoid any recurrence of the epidemic condition. This can be best done through the annual rechecking in the fall of the year, of the sample plots laid out this season.

Prineville, Oregon
October 9, 1933

F. P. Keen,
Entomologist.
U. S. Bureau of
Entomology.

SUMMARY

The Ochoco-McKay Creek pine beetle control project was organized in the fall of 1932 as a cooperative project between the Forest Service and the private timber owners represented by the Alexander-Yawkey interests to combat a serious outbreak of the western pine beetle on 56,000 acres of timberland at the western edge of the Ochoco National Forest.

For three years prior to control, the beetle depredations had been steadily increasing until a total of 61,000 M. feet of pine had been killed or approximately 10 per cent of the timber stand.

Control work was started in October 1932 and continued to the end of January 1933. The Forest Service portion of the area with 4,146 infested trees to treat on 18,000 acres was completed on December 20th at a cost of $10,245. The private timber owners with 20,000 trees to treat on 36,000 acres completed somewhat more than half the program when the work was stopped by deep snow and the destruction of 53 percent of the remaining broods by cold weather.

As a check upon the results of this work two survey crews were placed in the field and during the period September 25- October 7, 1933 check cruised 18 half section plots distributed over the treated areas and untreated areas in the general vicinity.

These plots showed that on the untreated areas nearest to the controlled areas, the losses of 1933 had been reduced by 48 percent or about half the loss sustained in 1932. This largely due, no doubt, to the winter killing of the broods and to some extent by better growth conditions and resistance of the trees.

The treated areas showed an average and almost uniform reduction of 85 percent, resulting in a total saving of 21,300 M. feet of pine timber of which 37 percent could be directly attributed to the control work. The large groups had been broken down so that only a scattered infestation in weakened trees now exists on the treated areas, while on the untreated areas groups of from 12 to 43 trees were frequently found.

What infestation now exists on the area can easily be accounted for by those beetles which escaped the winter freeze and were not reached by the control work. There was no evidence to indicate that the heavy infestation adjoining the treated areas had moved into the controlled area to any extent whatever.

For this year it is estimated that there are 6,850 infested trees representing the overwintery broods of beetles, but so much of this is in the form of scattered endemic infestation that only areas carrying more than 60 trees per section are recommended for recleaning in the fall 1937 program.

The Forest Service area averages only 30 trees per section and requires no further work. Of the private area 7,680 acres need recleaning and the work should be extended to approximately 18,760 acres not reached last year. It is estimated that this program of the private owners will involve the treatment of 5,800 trees at a cost of approximately $10,000.

To maintain control on this area, it should be kept under close observation for a number of years preferably by thorough rechecking of the plots established this year.

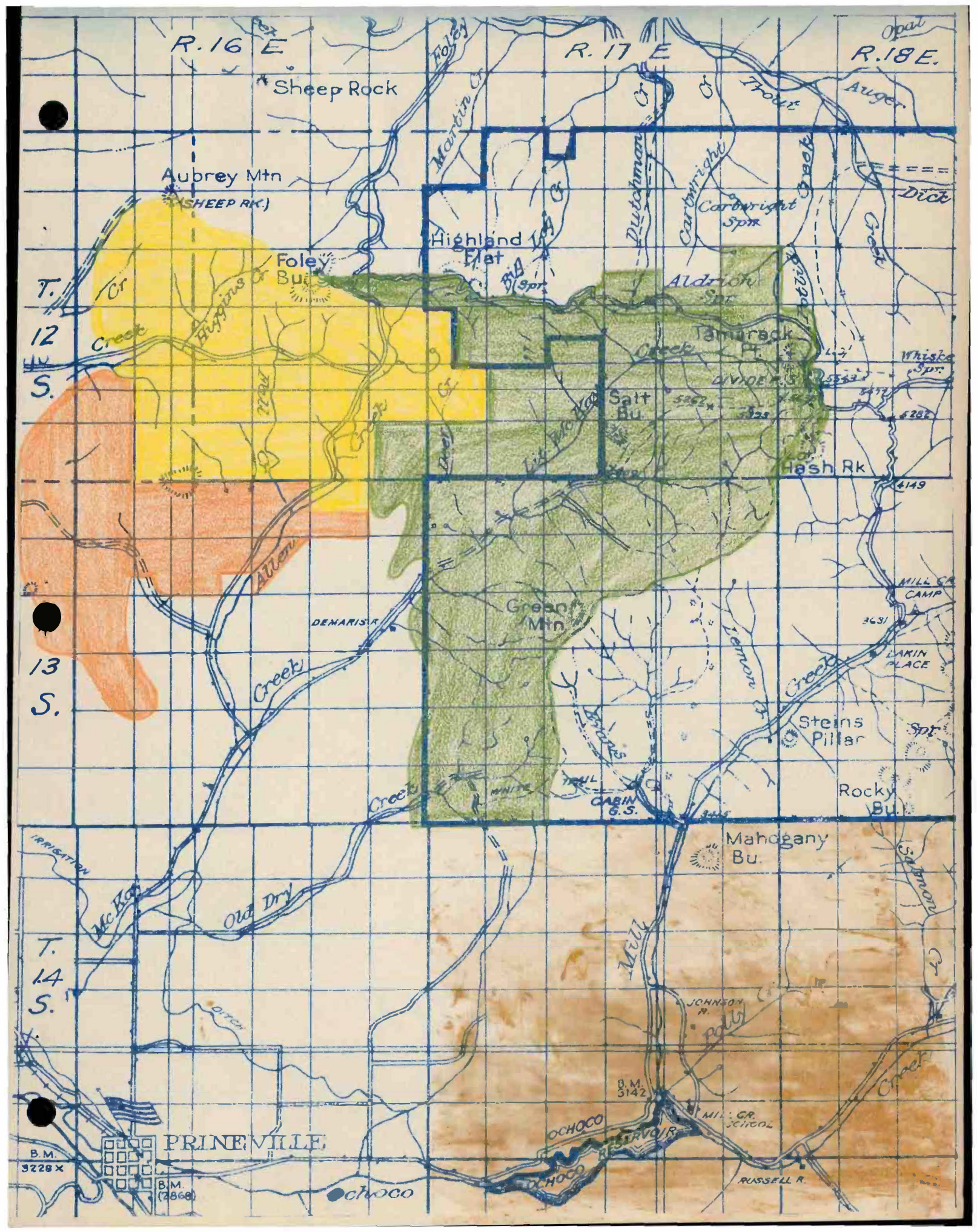
OCHOCO - McKAY CREEK
PINE BEETLE CONTROL PROJECT
SEASON 1933 - 1934.

Treated Area. No Recleaning Necessary.

Treated Area Requiring Some Recleaning.

Untreated Area. Original Control Work Needed.

Oct. 9, 1933.


R. 16 E.
R. 17 E.
R. 18 E.
Sheep Rock
Aubrey Mtn
(SHEEP RK.)
Foley Bu
Highland Flat
Aldrich Spr.
Tamarack Pt.
Salt Bu.
Hash Rk
4149
Green Mtn.
Steins Pillar
Spr.
Rocky Bu.
Mahogany Bu.
CABIN C.S.
MILL CR. CAMP
LAKIN PLACE
DEMARIS R.
Martin Cr.
Dutchman Cr.
Carbonate Cr.
Auger
Dick
Foley
Buggins Cr.
Allen
Lemon
Stevens
Old Dry
McKay
IRRIGATION
DITCH
JOHNSON R.
MILL CR. SCHOOL
OCHOCO RESERVOIR
OCHOCO
RUSSELL R.
PRINEVILLE
B.M. 3228 X
B.M. (2868)
B.M. 3142
T. 12 S.
T. 13 S.
T. 14 S.